

## Problem Set 3: Dynamic Game Theory

February 17, 1997 © David K. Levine

### 1. *The Folk Theorem*

For each of the following simultaneous move games, find the static Nash equilibria, and give an accurate sketch of the socially feasible individually rational region.

a)

	L	R
U	4,3	0,7
D	5,0	1,2

b)

	L	R
U	6,6	5,0
D	0,5	0,0

### 2. *Equilibrium in a Repeated Game*

Consider the simultaneous move stage game:

	U	D
U	1,1	-1,100
D	100,-1	0,0

Consider the “grim” strategy of playing U in period one, playing U as long as both players have played U in the past, and playing D otherwise. For what discount factors  $\delta$  do these strategies form a subgame perfect equilibrium?

### **3. Long Run versus Short Run**

Consider a “chain store” game in which an entrant must decide whether or not to enter the market. If no entry occurs the incumbent monopolist gets 2 and the entrant nothing. If entry occurs, the incumbent must choose between fighting and cooperating. If he fights, both firms get  $-1$ . If he cooperates the firms split the market, each getting 1. Suppose that the game is repeated between an infinitely-lived incumbent with discount factor equal to  $\delta$  and a sequence of short-lived entrants. What is the extensive and normal form of the stage game? What is subgame perfect in the stage game? What other Nash equilibria are there in the normal form? What is wrong with the Nash equilibrium that is not subgame perfect? Why is enter/cooperate subgame perfect equilibrium of the repeated game? For what value of  $\delta$  is it a subgame perfect equilibrium for the incumbent to fight as long as he has fought in the past, for entrants not to enter as long as the incumbent has always fought, and for enter/cooperate to occur after an incumbent has cooperated at least once?